pausal period. Cyclic bleeding following normal ovulation was observed only in five out of seventeen cases. In other instances the bleeding occurred from an endometrium corresponding histologically to the stage of proliferation, atrophy, or hyperplasia.

2. The abnormal menstrual bleeding at this time is no index to the underlying endometrial picture.

3. Hyperplasia of the endometrium was the most frequent finding and occurred in eight of the twenty cases studied. None of these patients complained of climacteric vasomotor symptoms.

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## SPINAL ANESTHESIA*

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AT the California State Prison at San Quentin, in the inclusive period 1913 to 1938, during which period approximately 38,000 men entered the institution, 4,892 general anesthetics were given; 200 of which were with the inhalants, and 4,674 with spinal anesthesia.

The use of the spinal form of anesthesia was more or less forced upon the Medical Department. In 1913 I was appointed chief surgeon of the California Prison. At that time there was a population of about 1,900 men. No provision had been made for a "free" assistant and, as I was the only doctor on the staff, I had to use one of the prisoners to give ether anesthesia whenever major surgery was required. This prisoner was a dipsomaniac. Following an operation he would purloin whatever alcohol might be left unguarded and would become intoxicated. Because of this it was necessary to discharge him from this duty. It then devolved upon me to not only give the anesthetic, but to do the operating. Spinal anesthesia offered a solution for this situation. As a result, spinal anesthesia has been used almost entirely for all operations below the nipple line at this prison during the past twenty-five years.

The summary does not include over 150 operations performed in the hospital on free people living outside the prison.

For the March, 1915, issue of the *California State Journal of Medicine* I wrote a paper on spinal anesthesia, based on 150 operations. In reviewing this article, one cannot but be impressed by the similarity in technique and results of twenty-five years ago and those found valuable at the present time.

*Summary of Operations, 1913-1938*

| | | |
|---|---|---|
| Operations on lower extremities | | 531 |
| Operations on abdomen: | | |
| Appendectomies | 615 | |
| Cholecystectomies | 49 | |
| Gastroenterostomies | 115 | |
| Herniotomies | 1,100 | |
| Miscellaneous | 40 | |
| | | 1,919 |
| Operations on anus | | 921 |
| Genito-urinary operations and examinations | | 893 |
| Miscellaneous operations | | 410 |
| Total | | 4,674 |

ANESTHETIC AGENTS

In the early years tropococain was used, but during the World War this could not be obtained and novocain or procain was substituted, and has been used continuously since.

The procain ampoules are prepared in our own laboratory. Two grains of the powdered drug are placed in the bottom of a long-size dram vial. The top is sealed over with a Bunsen burner. The ampoules are then sterilized in the autoclave.

PREOPERATIVE TREATMENT

The patient is not given any elaborate preoperative medication or sedation. Three-quarters grain of ephedrin is administered fifteen minutes before the time of the operation. The purpose of this is to keep up the blood pressure, which ordinarily falls with spinal anesthesia. Seldom is a sedative given, for it has been found that the patient frequently does better without one. But in nervous patients barbiturates are used. Very little morphin is given in prison. It is used to a minimum, both preoperatively and postoperatively. Nor do the patients often suffer from gas pains after the operation. It is not known whether this is due to the spinal anesthesia or the paucity of morphin.

INJECTION PROCEDURE

The patient is placed on the operating table in the operating room on his left side. An attendant brings the head to the knees, thus bowing the back outwardly. The back is painted with iodin or merthiolate and draped. A spinal needle is inserted in the space between the first and second lumbar spines. It is inserted directly inward, at a right angle to all surfaces.

In inserting the needle it is found best to grasp the needle near its point, with the butt-end of the needle in the palm. In this way the needle may be pushed through the skin without danger of bending or breaking.

The skin is not infiltrated with any anesthetic. The needle enters the dura with a distinct sensation transmitted to the hand of the operator.

On withdrawing the stylet, fluid emerges. A five cubic centimeter Luer syringe is attached, and about three or four cubic centimeters of fluid are removed. A small vial of the fluid is collected for serologic examination.

In the meantime, the ampoule is opened and the fluid in the syringe is mixed with the crystals until

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solution is reached. The syringe is again attached to the needle and, after withdrawing a few drops more of spinal fluid to insure that no air will be put into the canal, the procain solution is injected.

The patient is immediately placed in a Trendelenburg position. By the time the abdomen is draped the sensation of pain is gone and the operation may be started. Pain sense may, however, be determined by pinching the skin with tissue forceps.

The procain solution is heavier than the spinal fluid and gravitates toward the head, with the head lowered.

As soon as the field of operation is sufficiently desensitized, the table is leveled and the operation may begin. A screen is placed before the eyes of the patient. One assistant is assigned to taking blood pressure at five-minute intervals and to observing the patient. The patient, himself, may converse, and ordinarily has little or any uncomfortable sensation.

### COMMENT

The attendant serves a good purpose by talking to the patient and diverting his mind from the operation. However, in many cases the patient will sleep, especially if a cold towel is placed over his eyes.

In operating, it is found that the abdominal wall is greatly relaxed. It is not necessary to pull and tug with retractors and to pack off the intestines with many surgical towels. Because of the relaxed belly wall, the operations may be done in very much less time.

Sewing up is quite simple, because there is no expulsion of intestines into the wound. Cholecystectomies, gastro-enterostomies, and other upper abdominal surgery, are done with a minimum of effort and inconvenience to both operator and patient.

On occasions, in handling the stomach the patient may become nauseated, and in gall-bladder conditions pain may be referred to the cardiac region and also to the shoulder, but this soon passes away.

With procain the anesthesia lasts from one to two hours. This is long enough to perform almost any operation, especially when all tissues are relaxed and easily handled.

Following the operation the patient is returned to his room and may then be given veronal or some other sedative in case the pain should early return.

In operations which do not involve the viscera, such as amputations and hernias, the patient may take fluid by mouth soon after the operation, and his diet need not be greatly restricted. In this way convalescence is hastened. Seldom is there headache. This is probably due to the fact that great care is taken not to introduce any air into the spinal canal. Ordinarily the morning following the operation the patient is alert, cheerful, smiling, and feels fairly well.

In our experience there is no maximum age limit. Old people tolerate spinal anesthesia better than they tolerate the inhalants. It is felt best not to administer spinal anesthesia to children, although it has been done without untoward results.

Ordinarily cardiac disease is not a deterrent to the use of spinal anesthesia. Blood pressure is reduced, and the patient is quiet and does not struggle as he might in taking ether.

In our twenty-five-year experience in administering spinal anesthesia to approximately five thousand patients, there have been only three deaths. Two of these were, in fact, hopeless cases. One was almost exsanguinated by a stab wound in the stomach and the other was a bleeding carcinoma of the kidney. The third one died through mistaken dosage of six grains of a new preparation recommended by the detail man. It is felt that spinal anesthesia should not be given to patients in whom there is great shock, as in the two instances cited above.

Two women, to whom the usual amount of spinal anesthesia had been given, stopped breathing within five minutes after the administration. With both of these women it was necessary to keep up artificial respiration for, respectively, an hour and an hour and a half before they began to breathe voluntarily. These experiences are rather nerve-wracking to the surgeon, but teach that one should persevere with the artificial respiration. Evidently the respiratory center was temporarily paralyzed, but resumed function when the procain became ineffective.

The dosage for appendectomies, hernias, and other operations below the waist line is generally two grains of procain. Upper abdominal procedures require four grains.

Only occasionally is spinal anesthesia ineffective. This is probably due to the fact that procain does not get into the spinal canal, though it may seem to have done so. There is no objection to giving the patient a second injection if the first is not satisfactory. Usually the second will be effective. There is no objection to giving a patient several spinal anesthesias at intervals of days or weeks if an anesthetic is required.

In our experience there have been very few complications—only a few headaches, and occasional gas pains; no ocular paralysis, no retention of urine, and comparatively few lung involvements.

It is the opinion of the surgical staff—judging from a twenty-five-year experience—that spinal anesthesia in the majority of cases is preferable to that of inhalants.

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## REFRIGERATED CARTILAGE ISOGRAFTS

### THEIR SOURCE, STORAGE, AND USE

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IN reconstruction surgery there is a constant demand for an all-purpose supportive and defect-filling material. This material should simulate, when feasible, the tissue for which it is substituting as to supportive function and its ability to correct contour defects, and, when possible, its histologic pattern. The graft substance must be